

# Microplastic pollution in Flanders: obtained results, challenges and future perspectives

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Microplastic workshop 28/11/2023



Monitoring of plastics

HyPeR

PLUXIN

AS-MADE  
Assessment of Marine Debris on the Belgian Continental Shelf

CLEANSEA PROJECT

WEATHER-MIC

VLAAMSE MILIEUMAATSCHAPPIJ

Vlaanderen is milieu

SAMEN MAKEN WE MORGEN MOOIER

OVAM

EPHEMARE  
ECOTOXICOLOGICAL EFFECTS OF MICROPLASTICS IN MARINE ECOSYSTEMS

RESPONSE

Effects on ecosystem

Method development

ANDROMEDA

SeaBioComp

EURO CHARM

Volksgezondheid  
Veiligheid van de Voedselketen  
Leefmilieu

IMP TOX

CUSP

Effects on human health

Amongst others...



VLIZ pionier in zeekennis

UNIVERSITEIT GENT

Juli 2023



BELEIDSINFORMERENDE NOTA

Overzicht van het onderzoekslandschap en de wetenschappelijke informatie inzake (marien) zwerfvuil en microplastics in België.

Source: [Devriese et al. 2023](#)

Monitoring of plastics

Effects on ecosystem

Method development

Effects on human health

Amongst others...




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# Research projects in Flanders

## 1. Onderzoek naar verspreiding, effecten en risico's van microplastics in het Vlaamse oppervlaktewater (2021)

- Partners: UGent, VMM, VITO
- Financiering: VMM



## 2. Plastic baseline (t0) measurement in the scope Flemish Integral Action Plan on Marine Litter (2022)

- Partners: VLIZ, UGent, UAntwerpen, KU Leuven
- Financiering : OVAM/FostPlus



## 3. PLUXIN - Plastic Flux for Innovation and Business Opportunities in Flanders (ongoing)

- Partners: VLIZ, UGent, UAntwerpen, KU Leuven, VITO
- Financiering : VLAIO (The blue cluster)



## 4. Policy informing brief: Analysis on the link between microplastics, the environment and public health (2023).

- Funding: Federal Public Service Health, Food Chain Safety, and environment

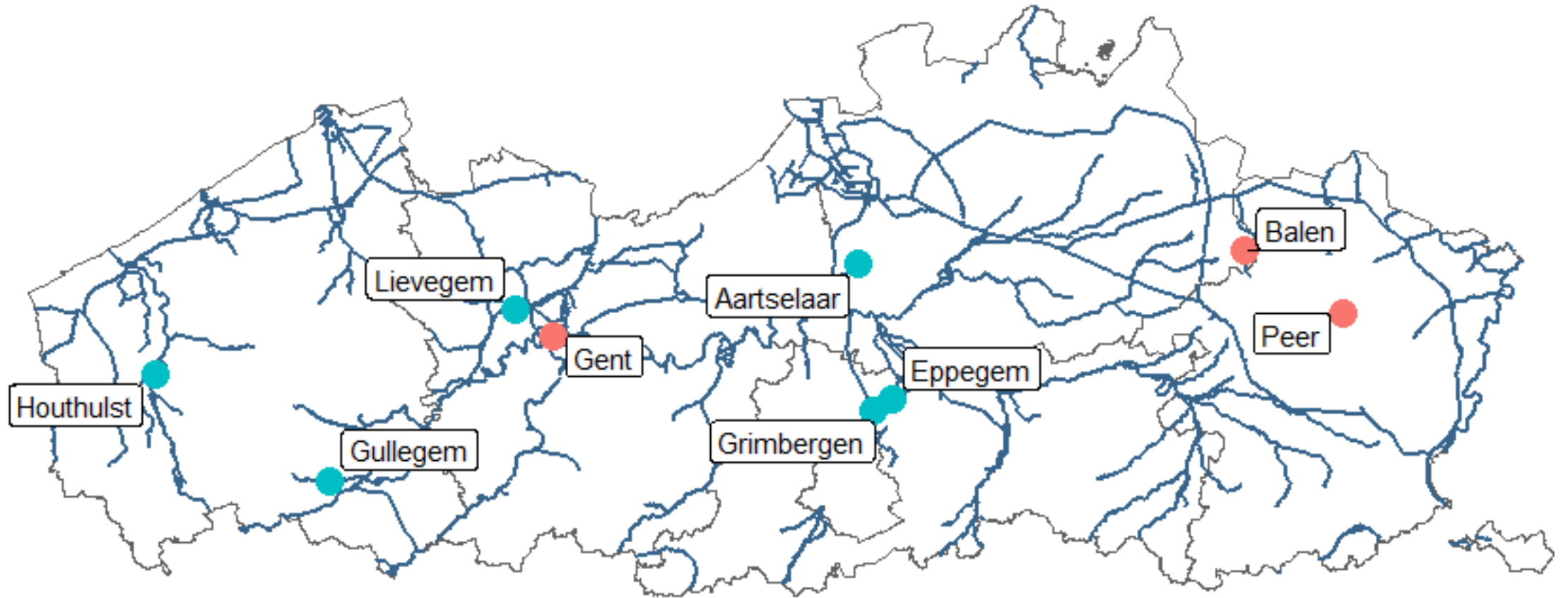


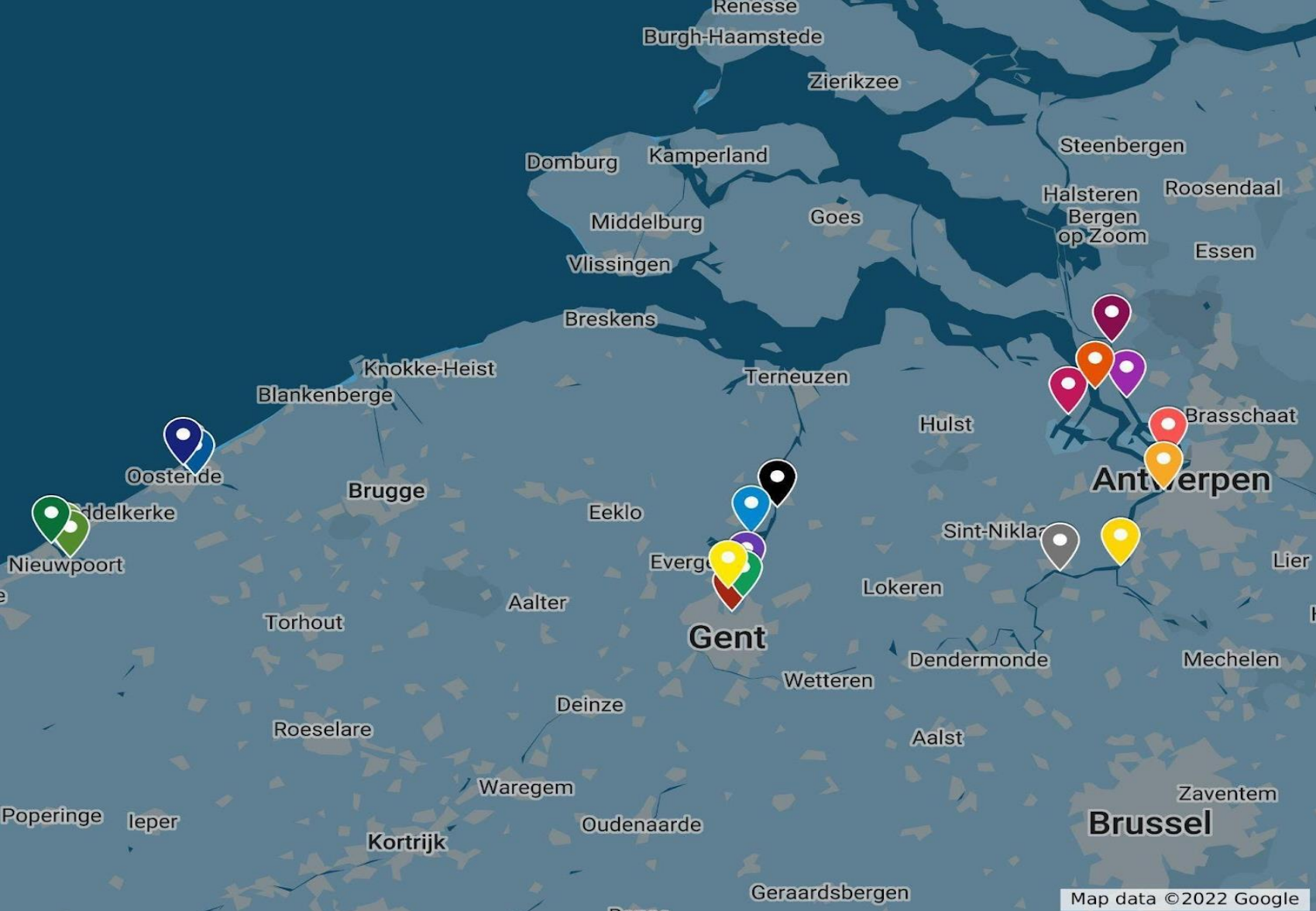
# Microplastic pollution in Flanders



# Microplastic pollution in Flemish surface waters?

● Oppervlaktewater ● Oppervlakte water en sediment





## Plastic baseline (t0)

### measurement in the scope Flemish Integral Action Plan on Marine Litter

- **346 stalen** (June 2020 - July 2021)
- Surface water:
  - Scheldt: 42.9 MP/m<sup>3</sup> (max 273.3), (PS, PP, PE)
  - Oostende: 8.8 MP/m<sup>3</sup> (PP, PS, PET)
  - Nieuwpoort: 6.8 MP/m<sup>3</sup> (PAM, PS, PET, PP)
- Sediment
  - Scheldt: 2757.7 MP kg DW<sup>-1</sup>
  - Oostende: 4058.1 MP kg DW<sup>-1</sup>
  - Nieuwpoort: 2824.8 MP kg DW<sup>-1</sup>



# Conclusions based on monitoring

1. Microplastics are **ubiquitous** in the rivers in Flanders
2. Microplastic concentrations in sediment are high, indicating **sediment to be sinks of microplastics.**
3. There is a **spatiotemporal variability** in the measured concentrations

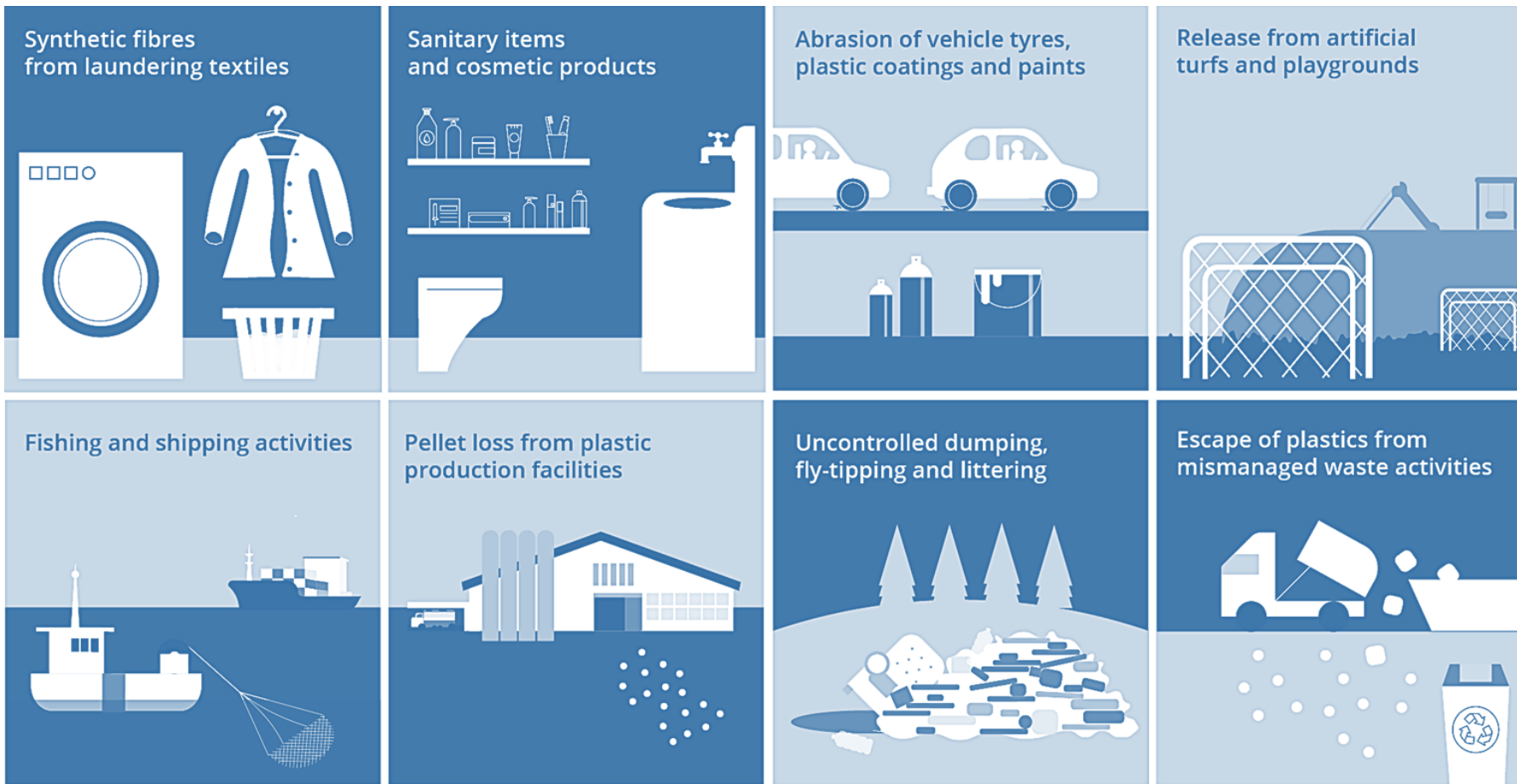




# Source of microplastic pollution



Sources of pollution

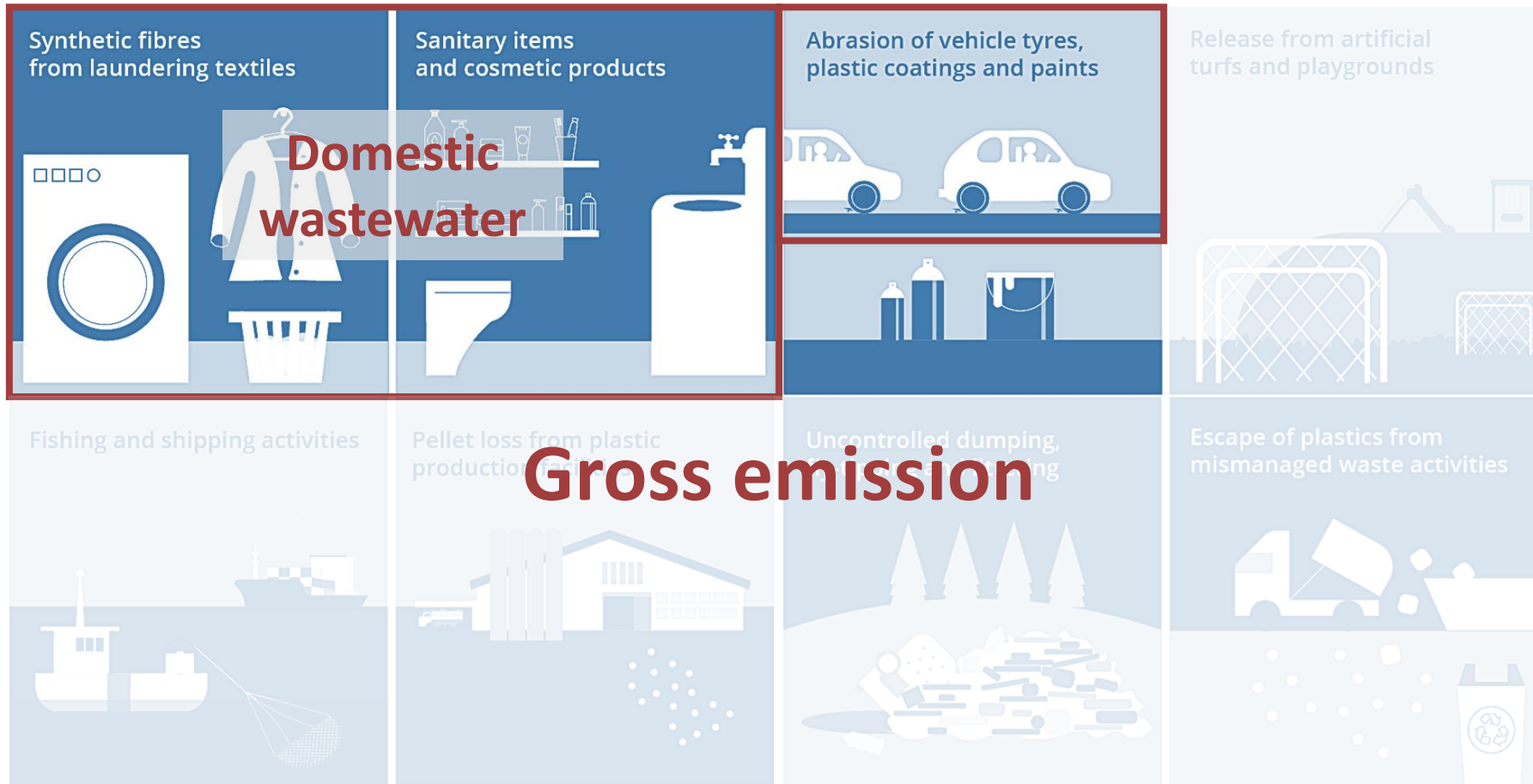


Surface water



Bron: European Environment Agency

Sources of pollution



Gross emission



Net emission to surface water



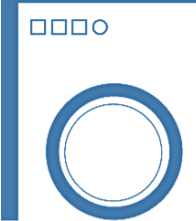
**355 - 1634 microplastics  
per day per person**

WWTP

**97,5 % clearance**

## Domestic wastewater

Synthetic fibres  
from laundering textiles



Sanitary items  
and cosmetic products



**Important side note:** 'only' 83 % of  
the households is connected to an  
active wastewater treatment plant  
(WWTP)

## Domestic wastewater



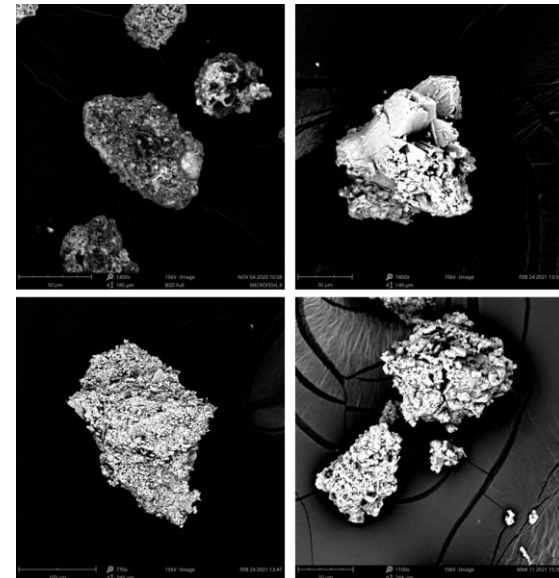
Yearly net emission of microplastics to  
surface water in Flanders (WEISS):

**623 kg microplastics or  
567 x 10<sup>9</sup> particles**

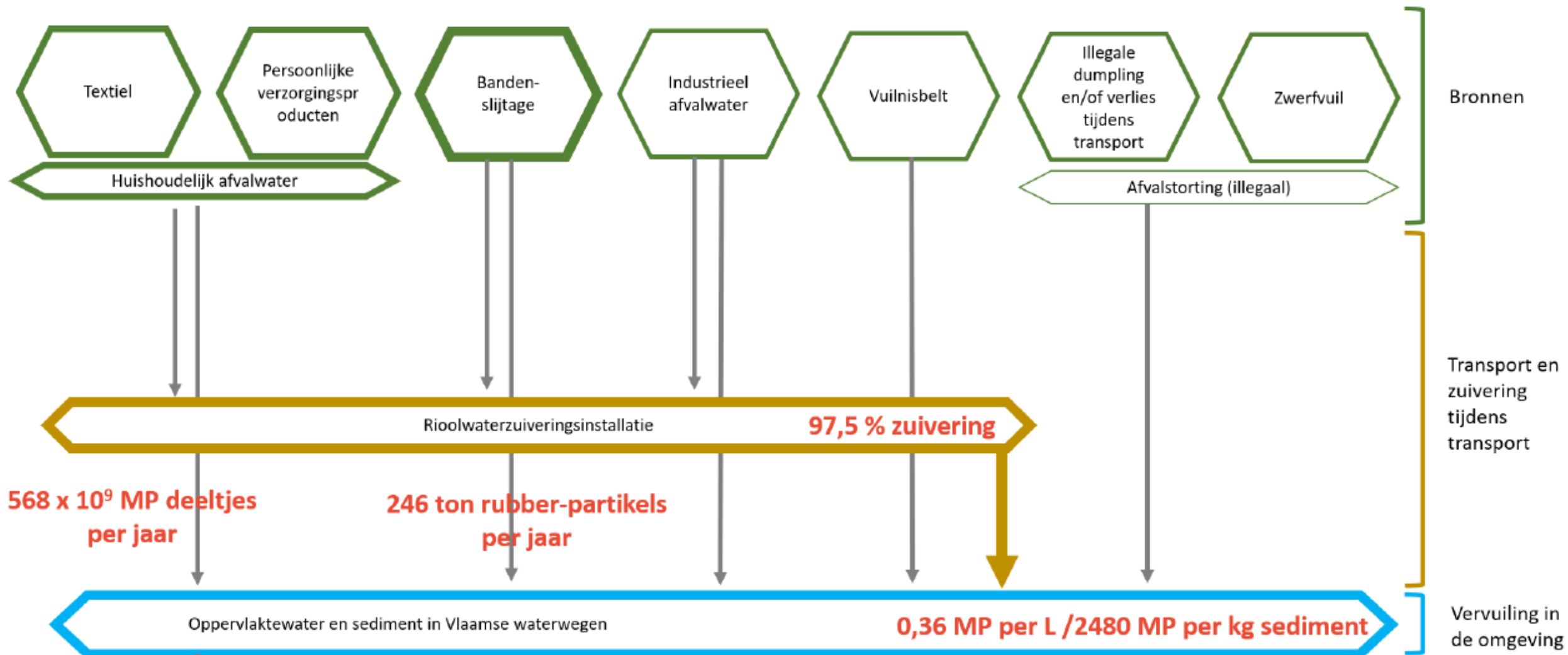
# Tire and road wear particles

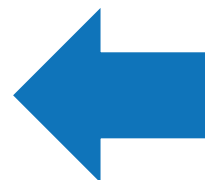
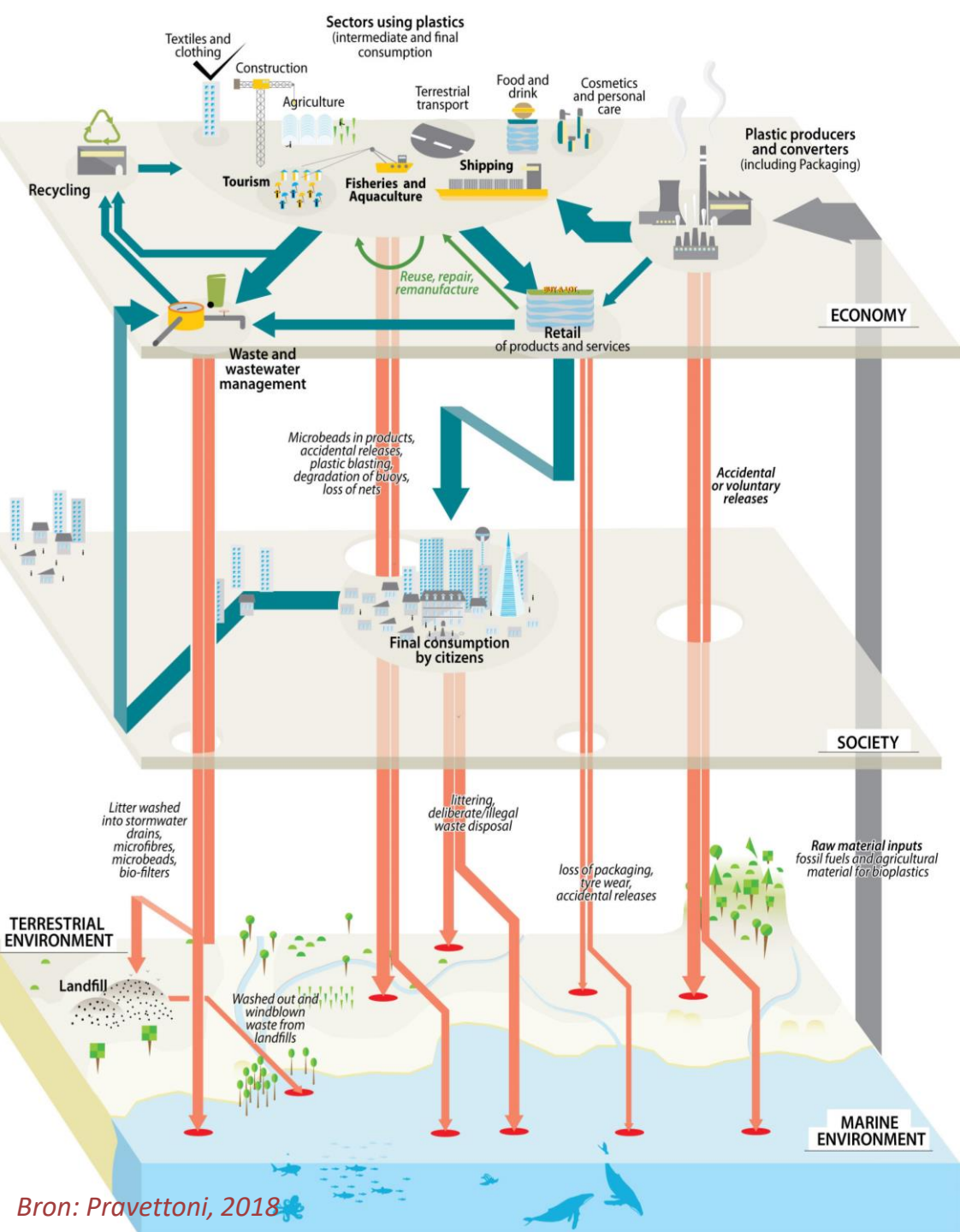


Yearly net emission of tire wear particles to the rivers in Flanders  
(WEISS):  
**246 ton tire wear particles**



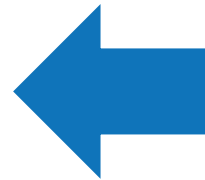
Source: [Vercauteren et al. 2023](#)





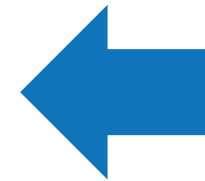
**Source-focused approach**

e.g. ECHA restriction

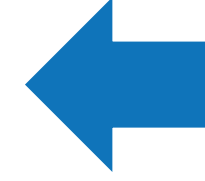


**Prevention**

e.g. Increase connection to active WWTP  
 e.g. connect road-run off to WWTP



**Emission monitoring**



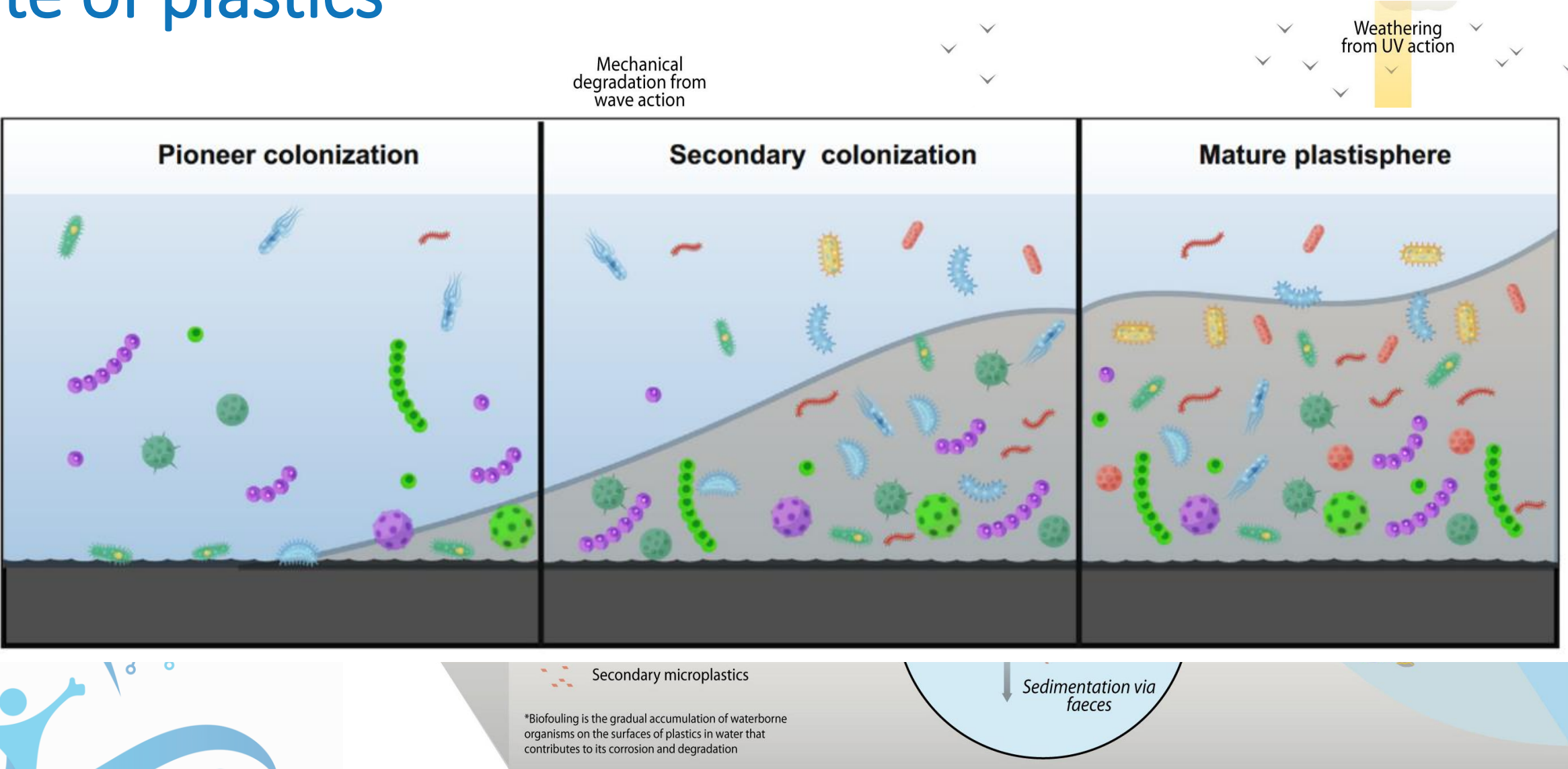
**Environmental monitoring and risk assessment**



# Transport and fate of plastics

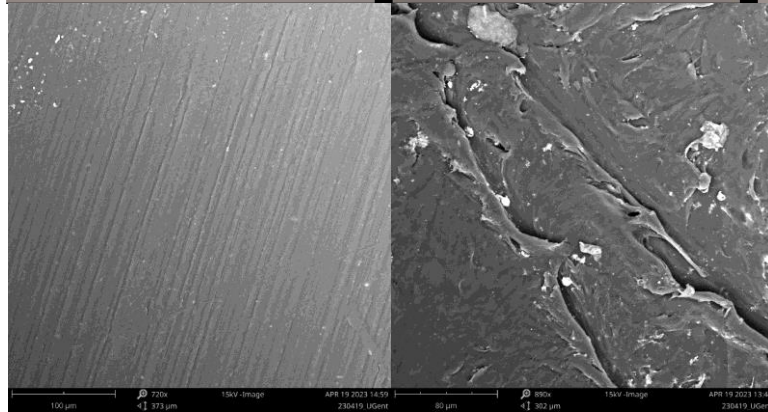
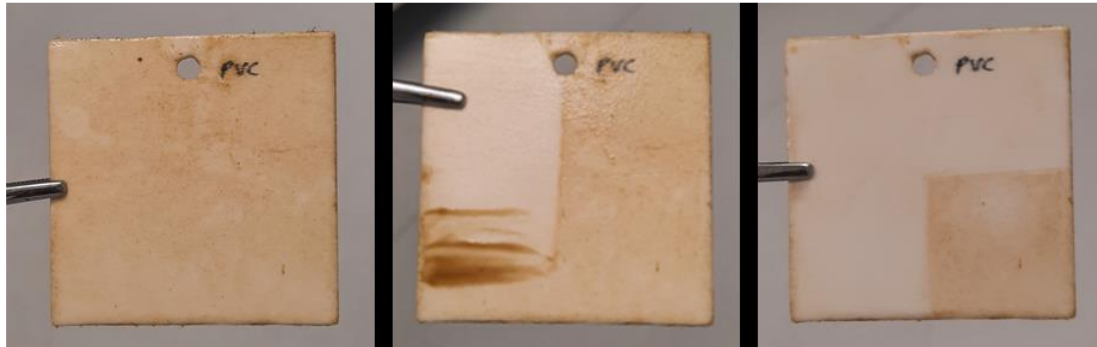


# Natural processes affecting the distribution and fate of plastics

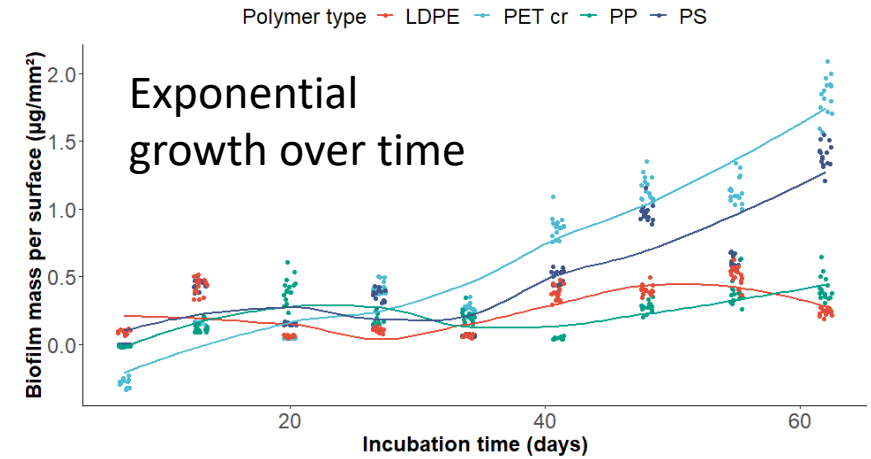


Source: [Grid Arendal](#)

# Microplastic-specific biofilm growth determines the vertical transport of plastics in freshwater

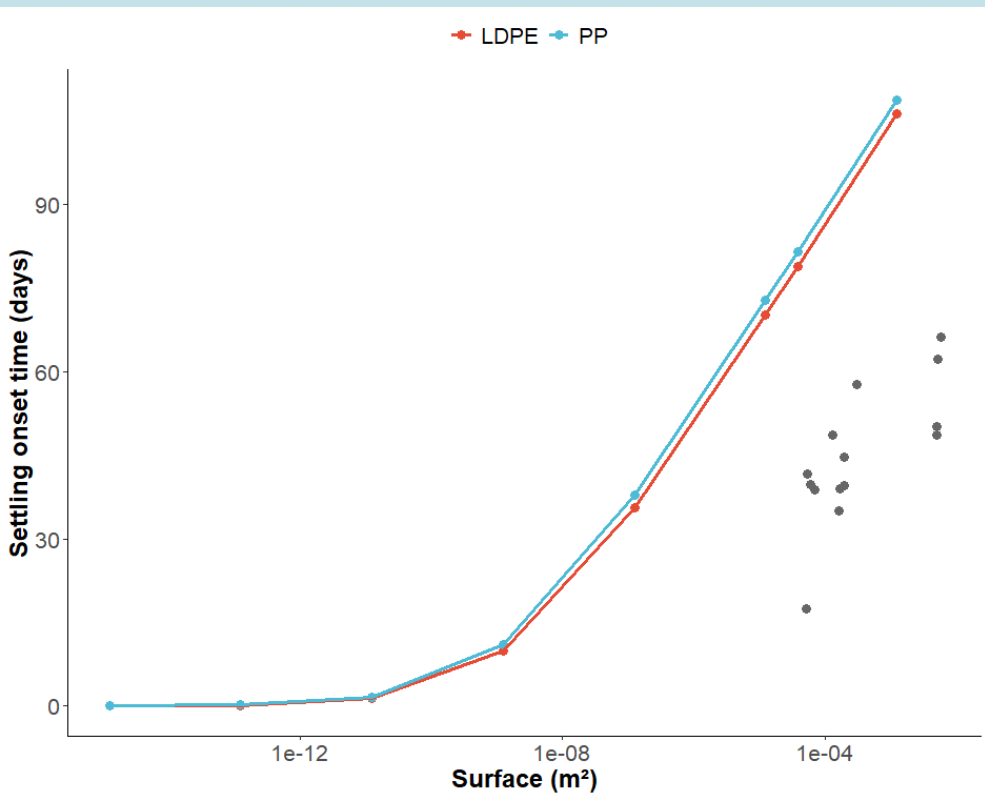
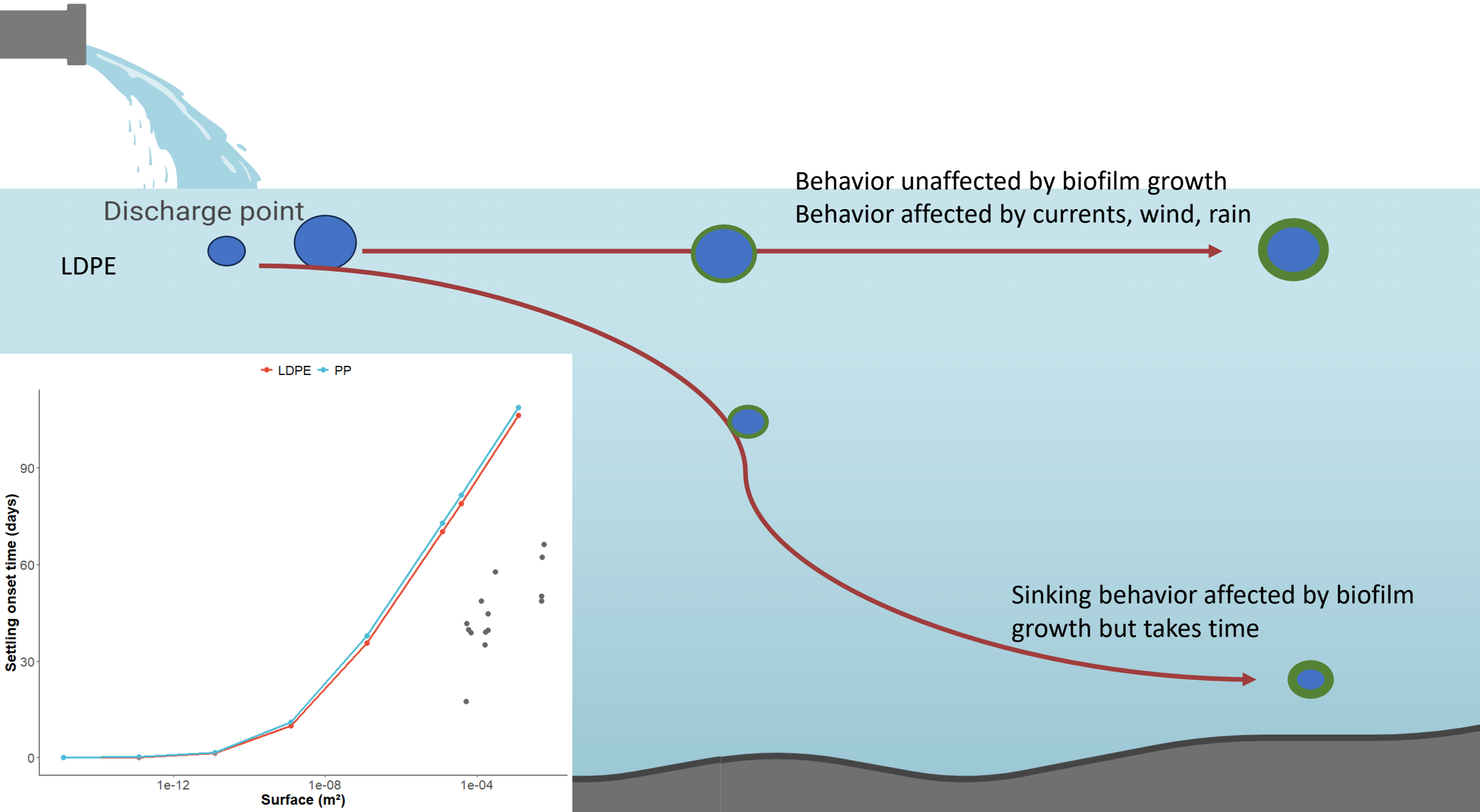


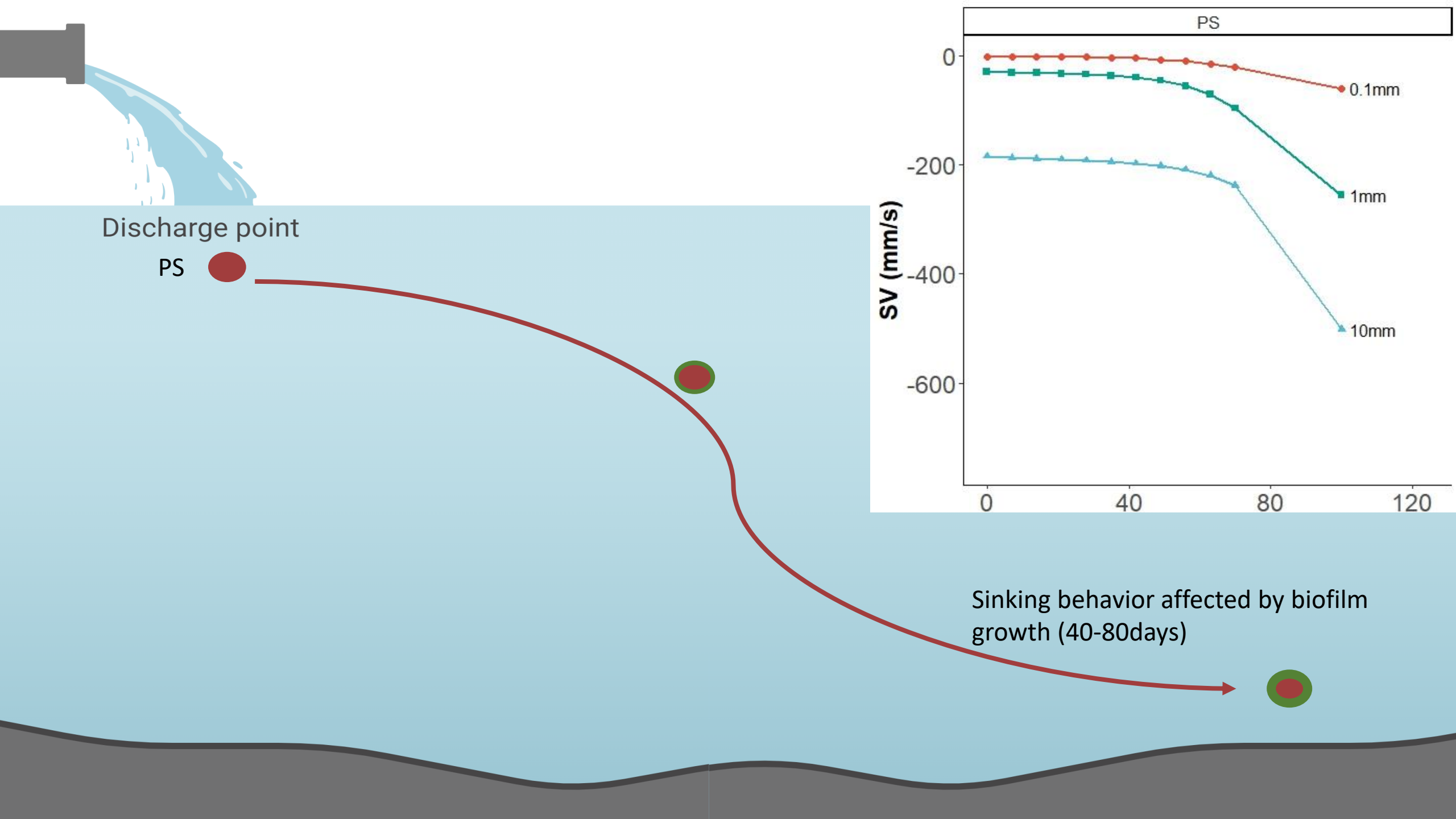
Biofilm growth is **polymer specific** and affected by **surface roughness**

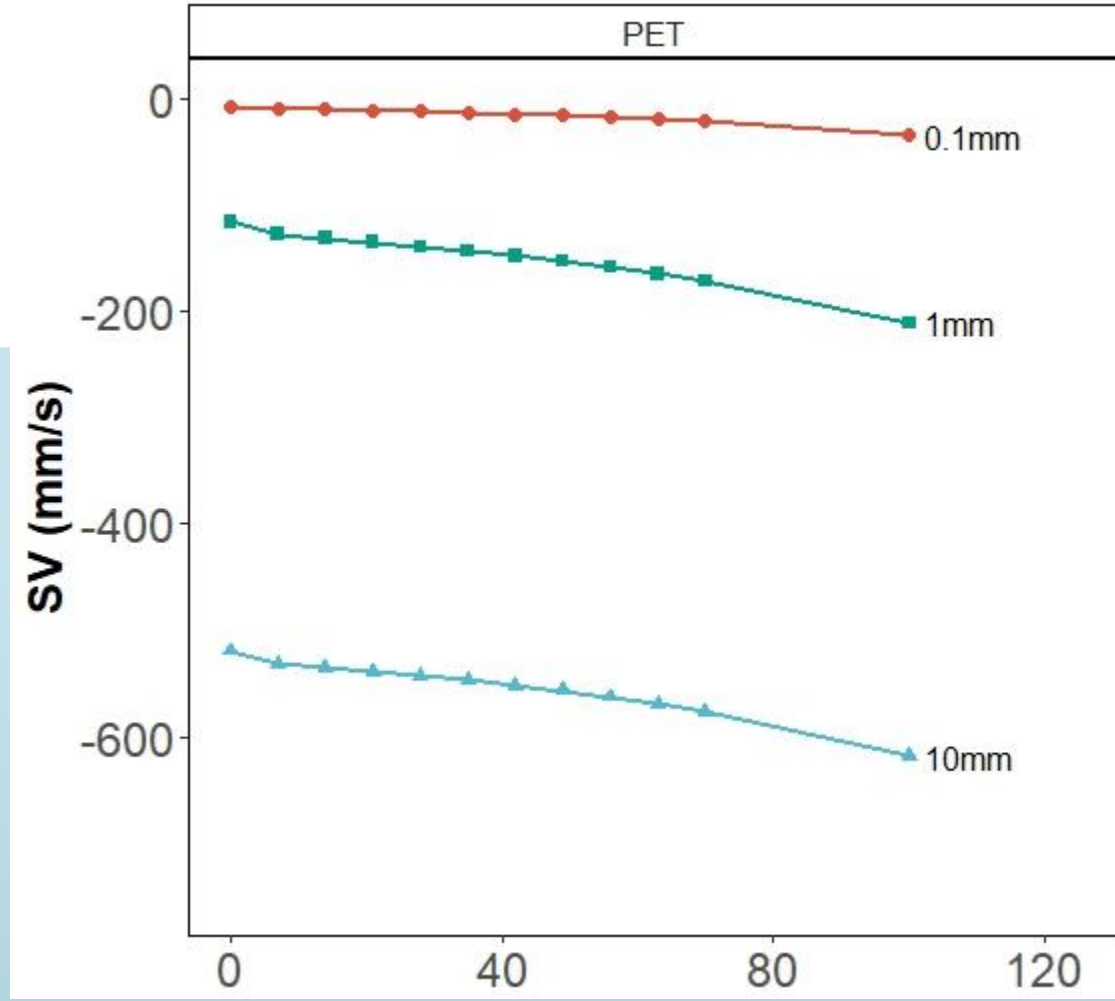
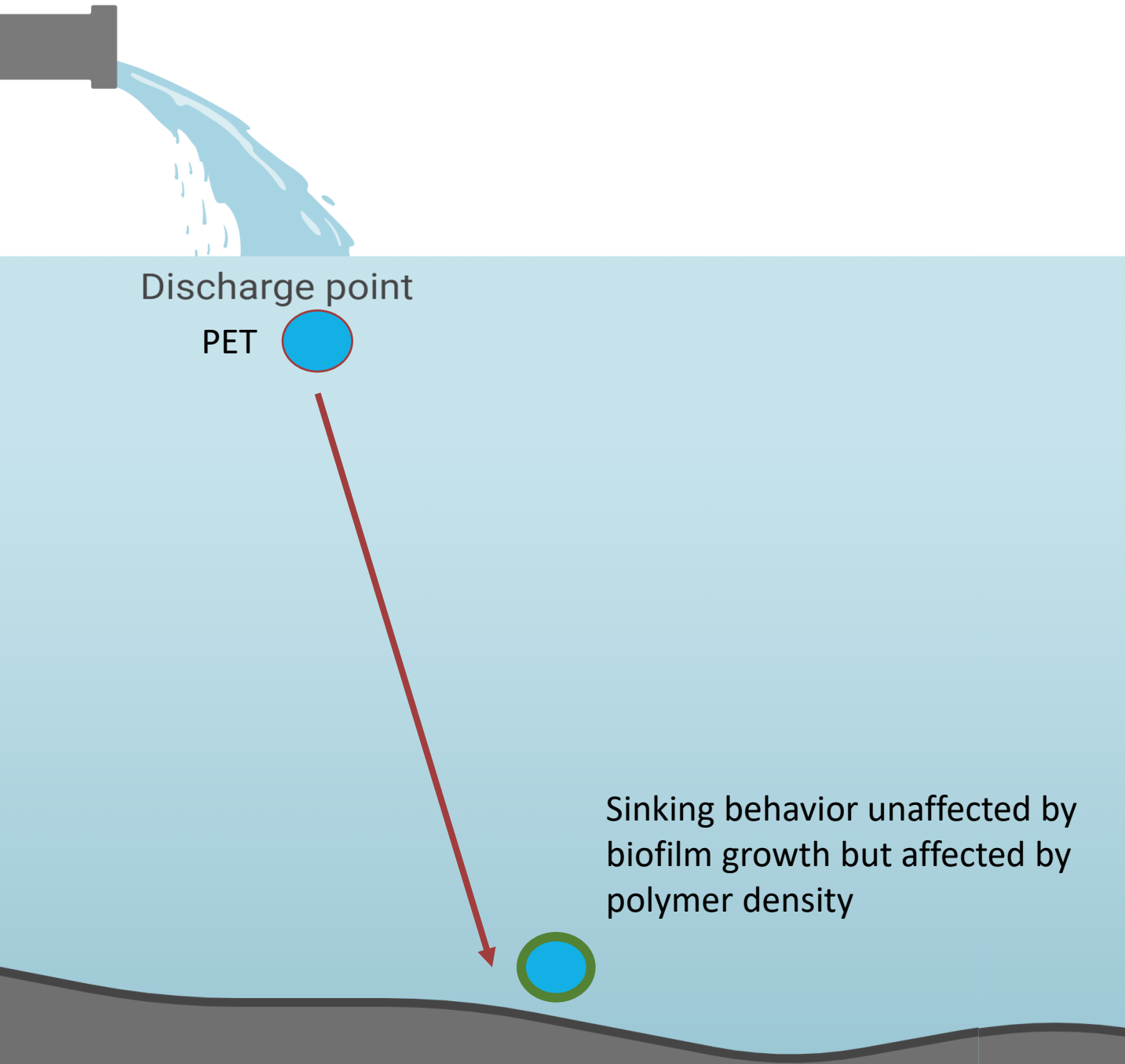


Predictions of settling onset time and sinking velocity in environment

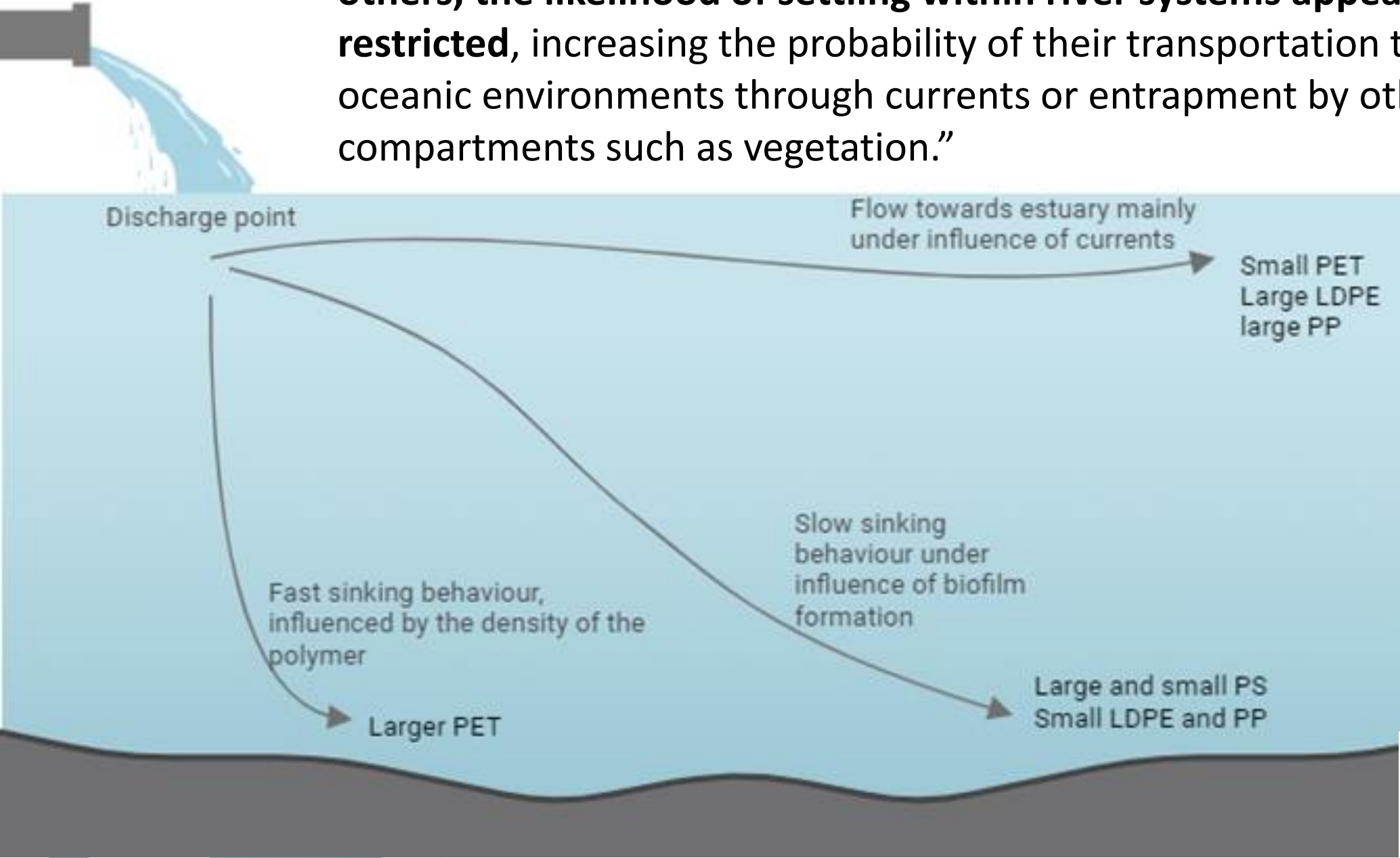






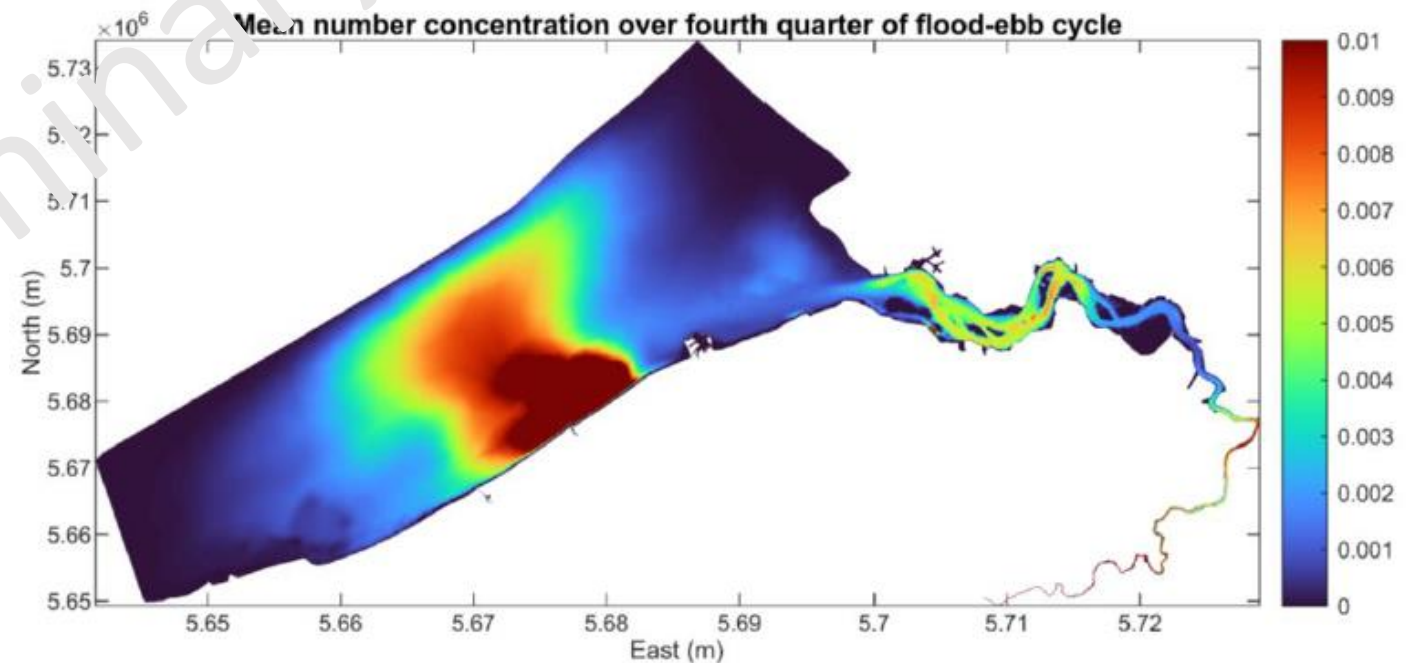
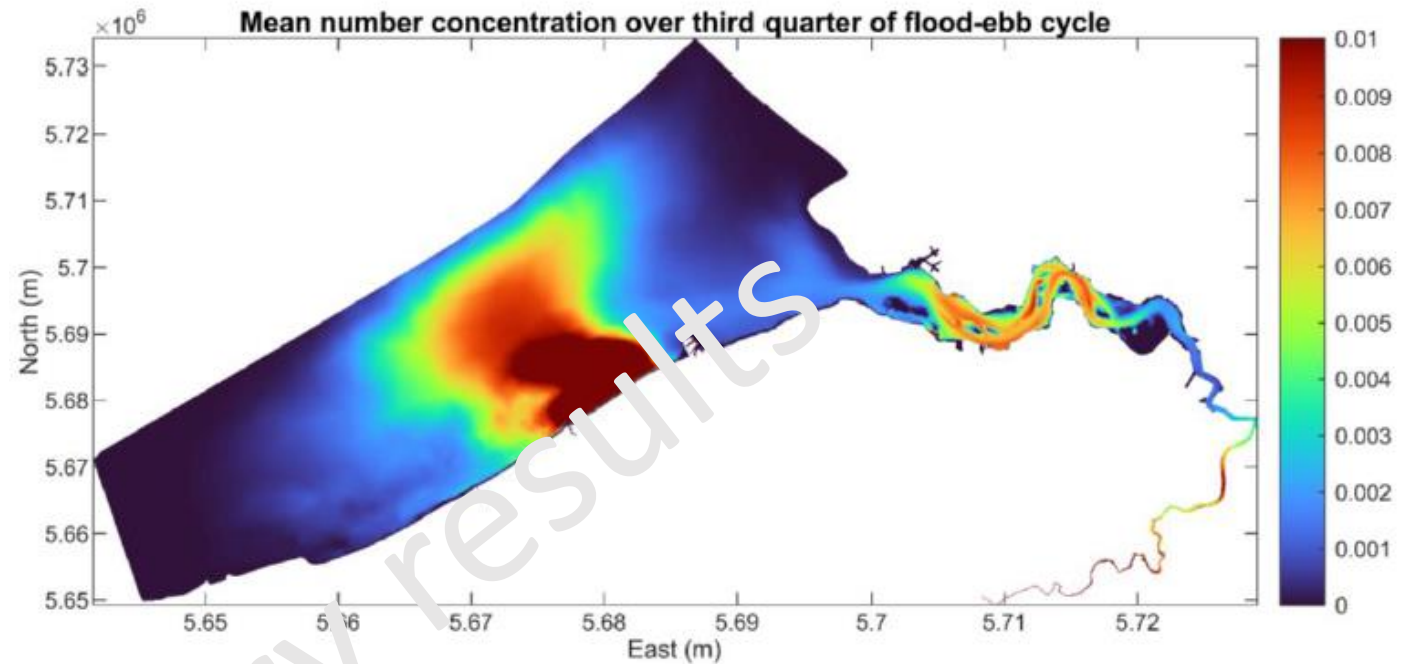


“Our work shows that **rivers can serve as sinks for certain particles, while for others, the likelihood of settling within river systems appears relatively restricted**, increasing the probability of their transportation to estuarine or oceanic environments through currents or entrapment by other compartments such as vegetation.”



# Hydrodynamic model

Estuaries as possible microplastic sinks influenced by tidal cycles.



KU LEUVEN

Source: [Everaert et al., 2022](#)



# Current challenges



# Current challenges

Heterogeneity of microplastics

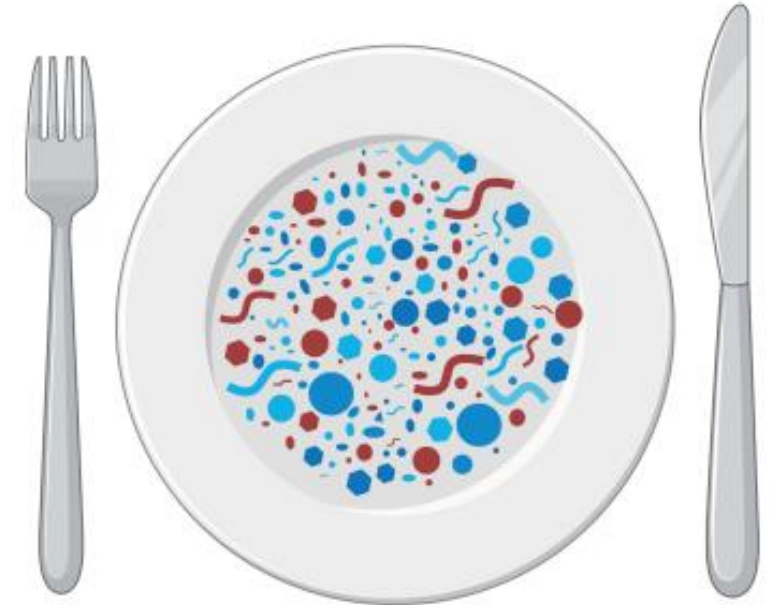
Methods

Health-based guidance values



Risk assessment framework

Analysis on the link between microplastics, the environment and public health.



Policy informing brief

# Heterogeneity of microplastics



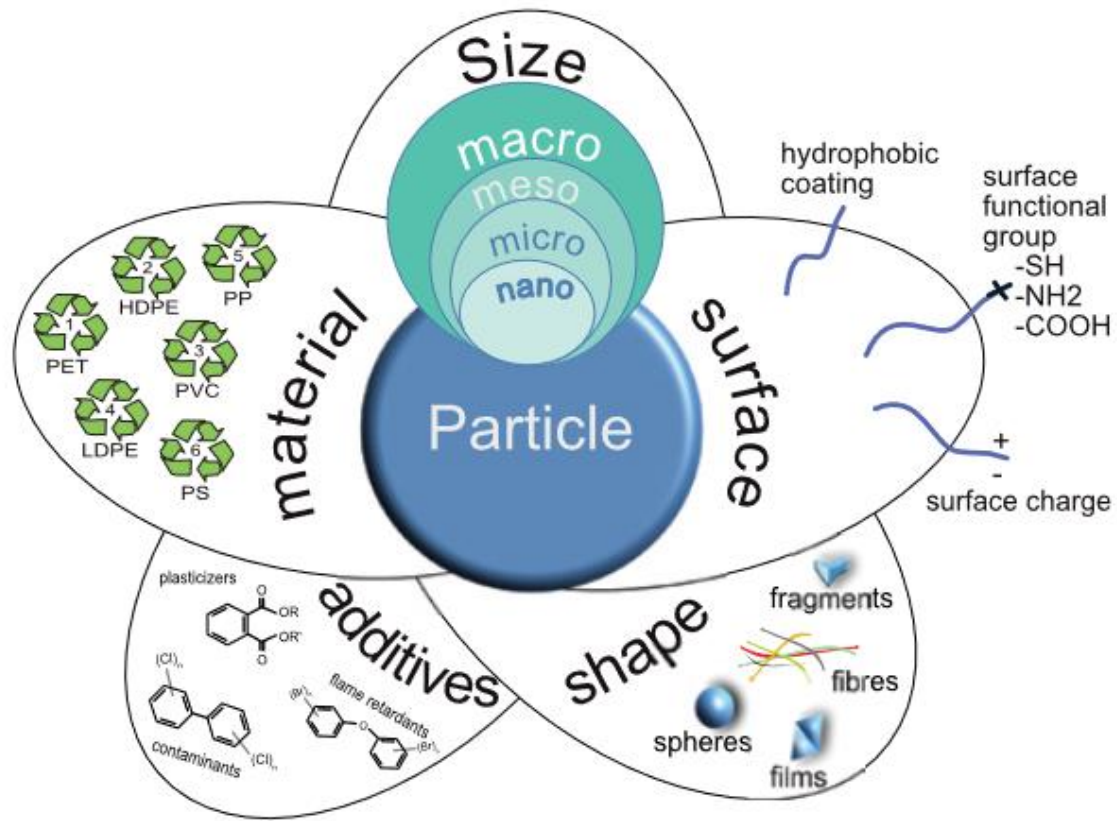
Polyethylene  
White  
150  $\mu\text{m}$   
Fragment

Polyethylene terephthalate  
Green  
500  $\mu\text{m}$   
Fiber

Polystyrene  
Blue  
750  $\mu\text{m}$   
Film



# Heterogeneity of microplastics

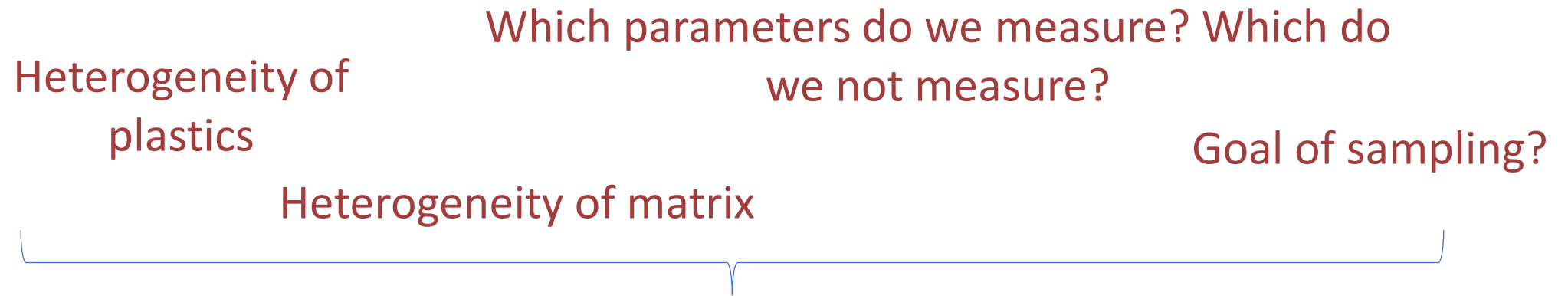


- Which parameters do we measure?
- Which do we not measure?

**Not one size fits all!!!**



# Methods - Choice



Sample collection

- Mantanet
- Filtration
- ...

Extraction from matrix

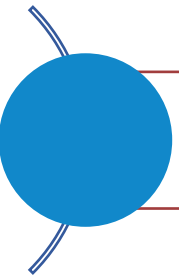
- Digestion
- Filtration
- Density separation
- ...

Characterization/identification

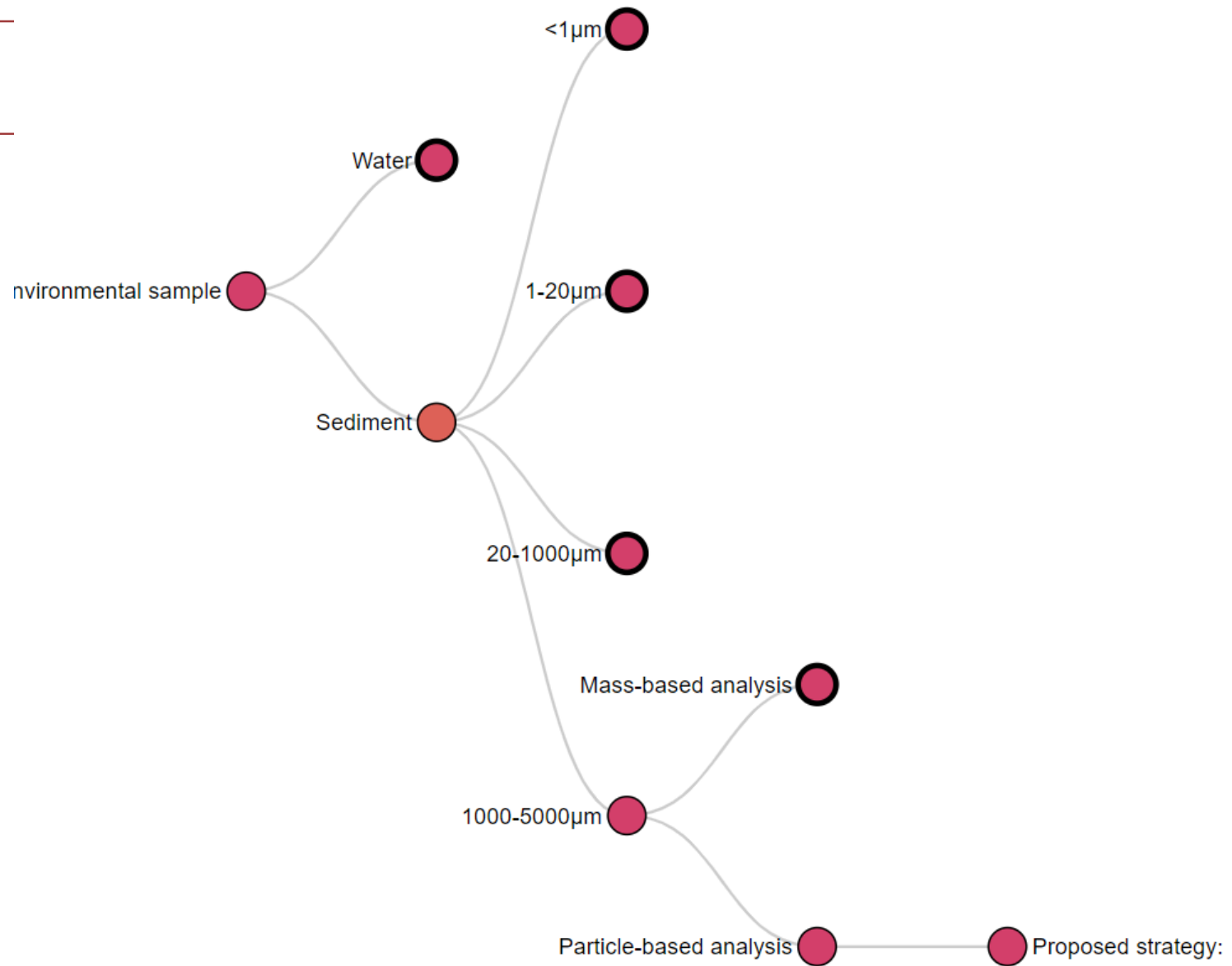
- Microscopy
- Spectroscopy
- Mass spectrometry
- ....

Not one size fits all!!!



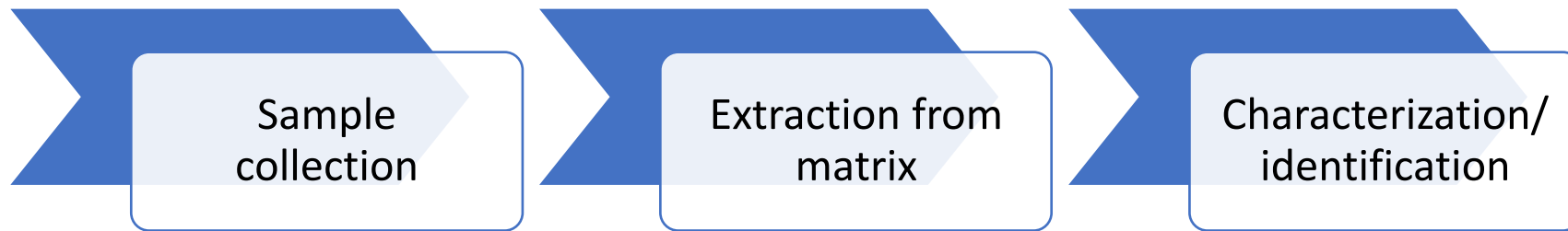


# Methods





## Methods - Standardization



No standardization of methods (yet)





# Methods

## Plastics in environment

ISO/TC 61/SC 14

CEN/TC 249/WG 24

CEN/TC 444/WG6

## Marine environment monitoring

EuroQCharm

## Microplastic research

COST action PRIORITY

## Ongoing efforts on standardization

## Microplastic in drinking water

JRC in collaboration with ISO/TC  
147/SC 2/JWG 1

## Textiles

ISO/TC 38/WG 34

ISO/TC 38/WG 35

## Rubber and rubber products

ISO/TC 45/WG 16

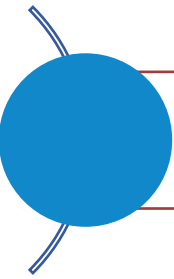
## Water quality

ISO/TC 147/SC 2/JWG 1

ISO/TC 147/SC 6/WG 16







# Methods - nanoplastics

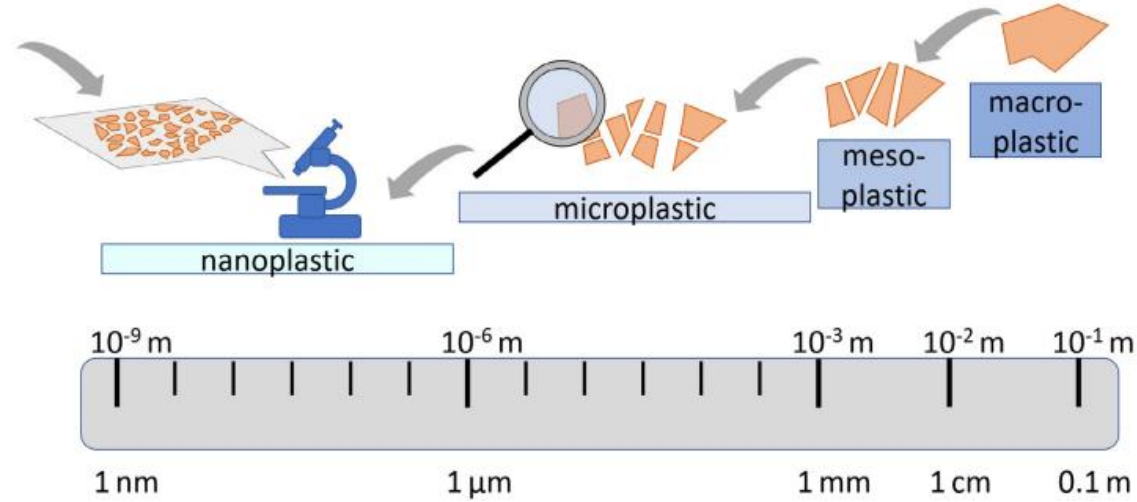


Estimated higher number of particles



Available methods

Toxicological relevance



Sources: Hartmann et al 2019; MetaBallStudios

# Future perspectives



**The next big thing  
will be a lot of small things.**



**Prof. dr. ir. Jana Asselman**  
**Prof. dr. Colin R. Janssen**  
**Dr. Maaike Vecauteren**

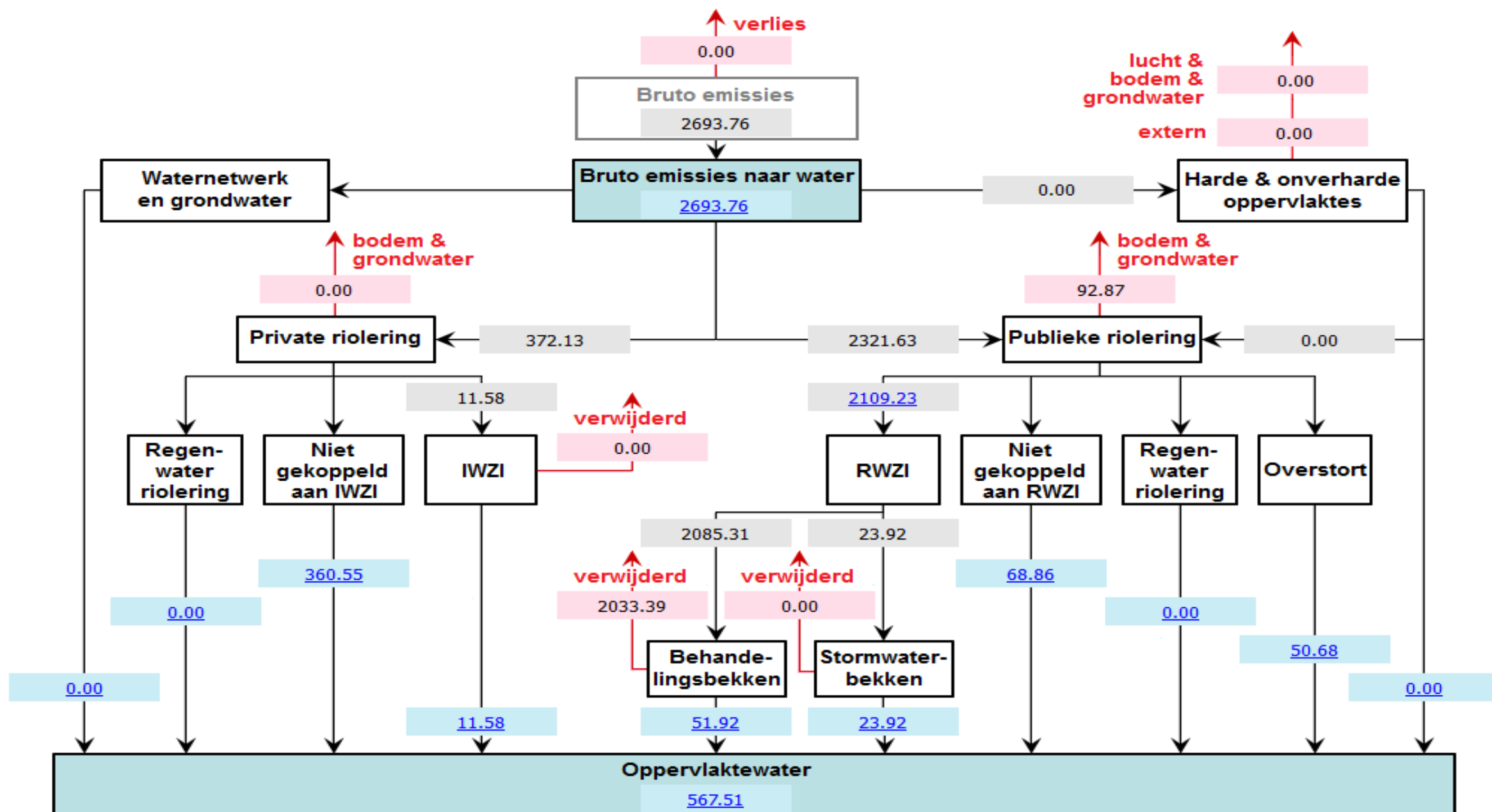
**E [Maaike.Vercauteren@ugent.be](mailto:Maaike.Vercauteren@ugent.be)**

**UGent Campus Ostend**  
**Bluebridge**  
**Ostend Science Park 1**  
**8400 Oostende**



# Questions?





↑ verlies

0.00

Bruto emissies

2693.76

Bruto emissies naar water

2693.76

↑  
lucht &  
bodem &  
grondwater  
extern

0.00

0.00

Waternetwerk  
en grondwater

0.00

Harde & onverharde  
oppervlaktes

0.00

↑  
bodem &  
grondwater

0.00

Private riolering

372.13

2321.63

Publieke riolering

0.00

Regen-  
water  
riolering

0.00

Niet  
gekoppeld  
aan IWZI

360.55

IWZI

11.58

↑  
verwijderd

0.00

RWZI

2109.23

Niet  
gekoppeld  
aan RWZI

68.86

Regen-  
water  
riolering

0.00

Overstort

0.00

↑  
verwijderd

2033.39

Behande-  
lingsbekken

51.92

↑  
verwijderd

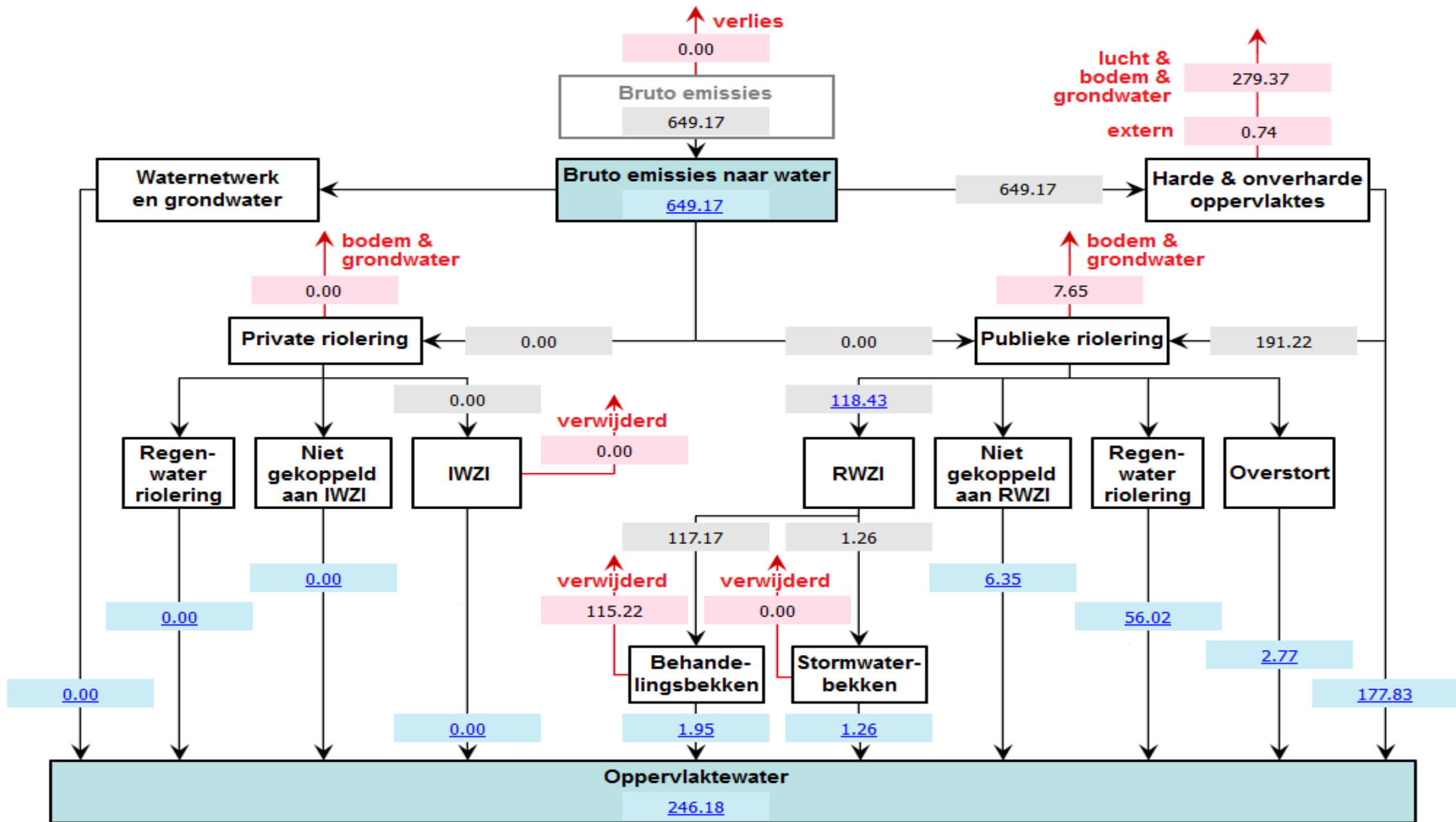
0.00

Stormwater-  
bekken

23.92

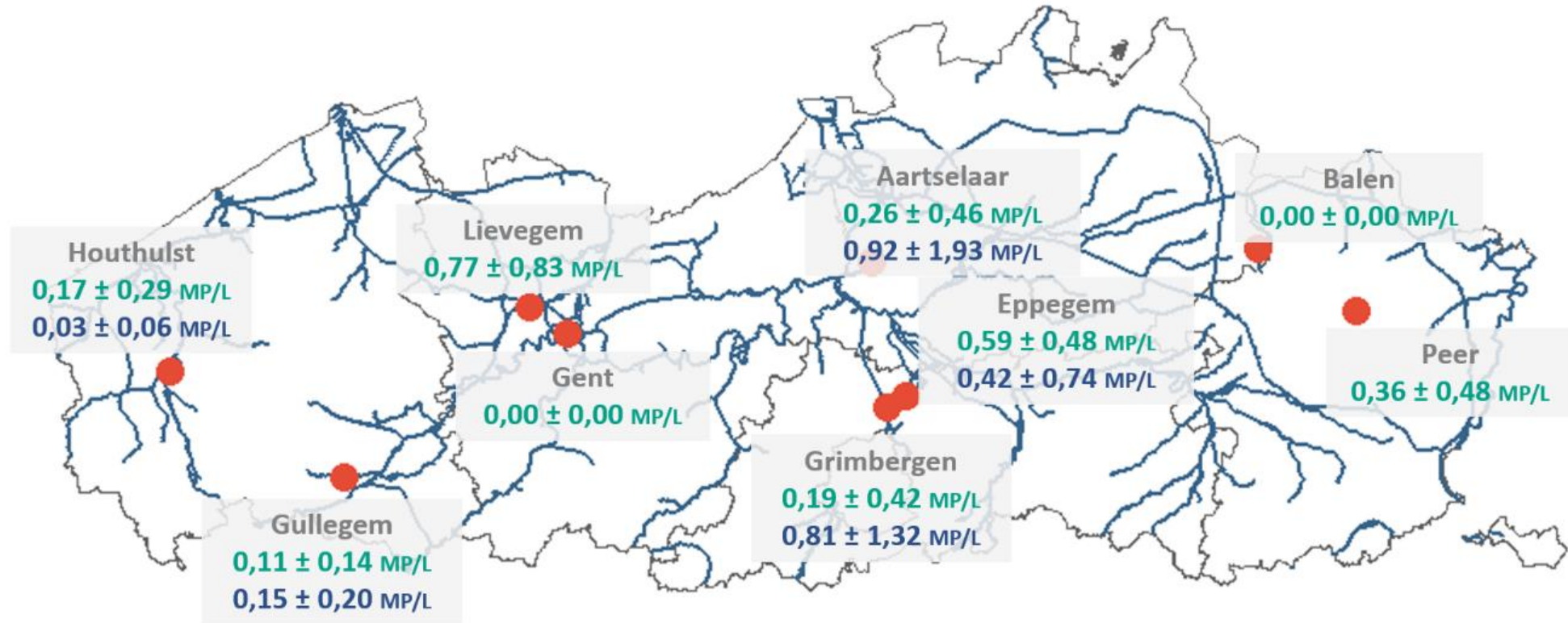
Oppervlaktewater

567.51





# Microplastics in surface water

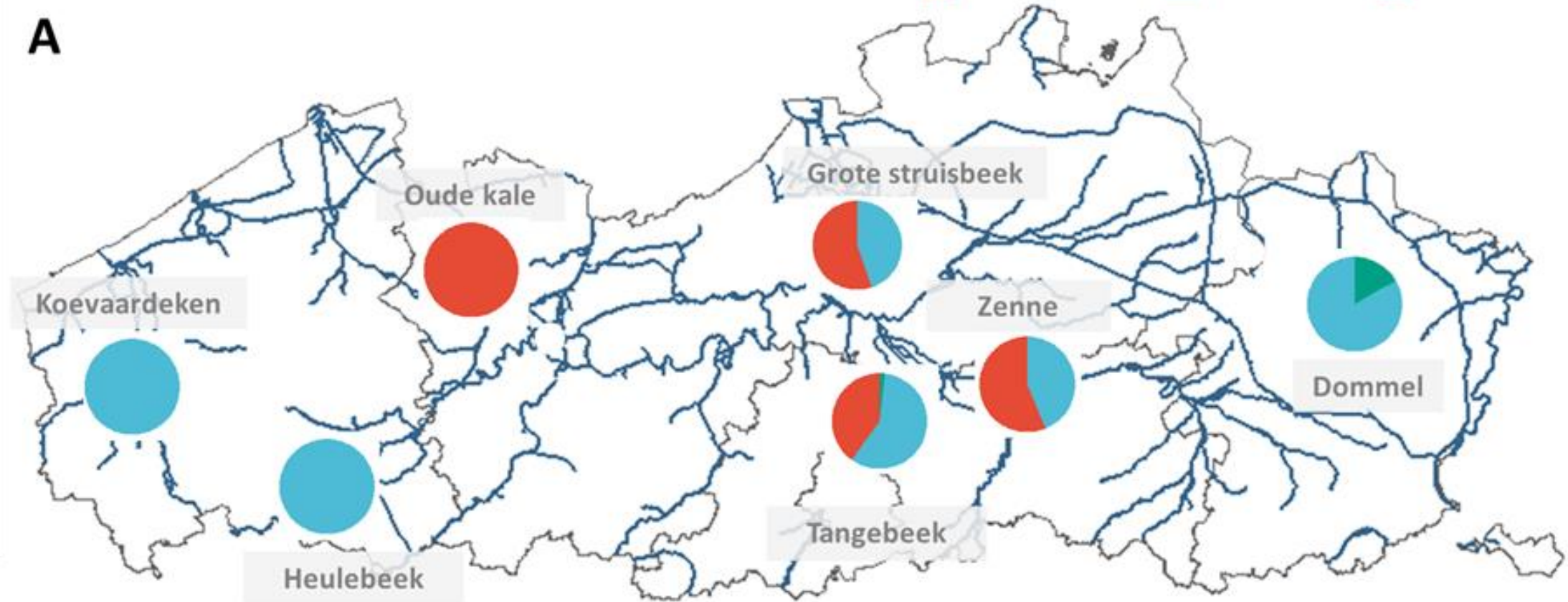


MP concentratie droog weer  
MP concentratie nat weer

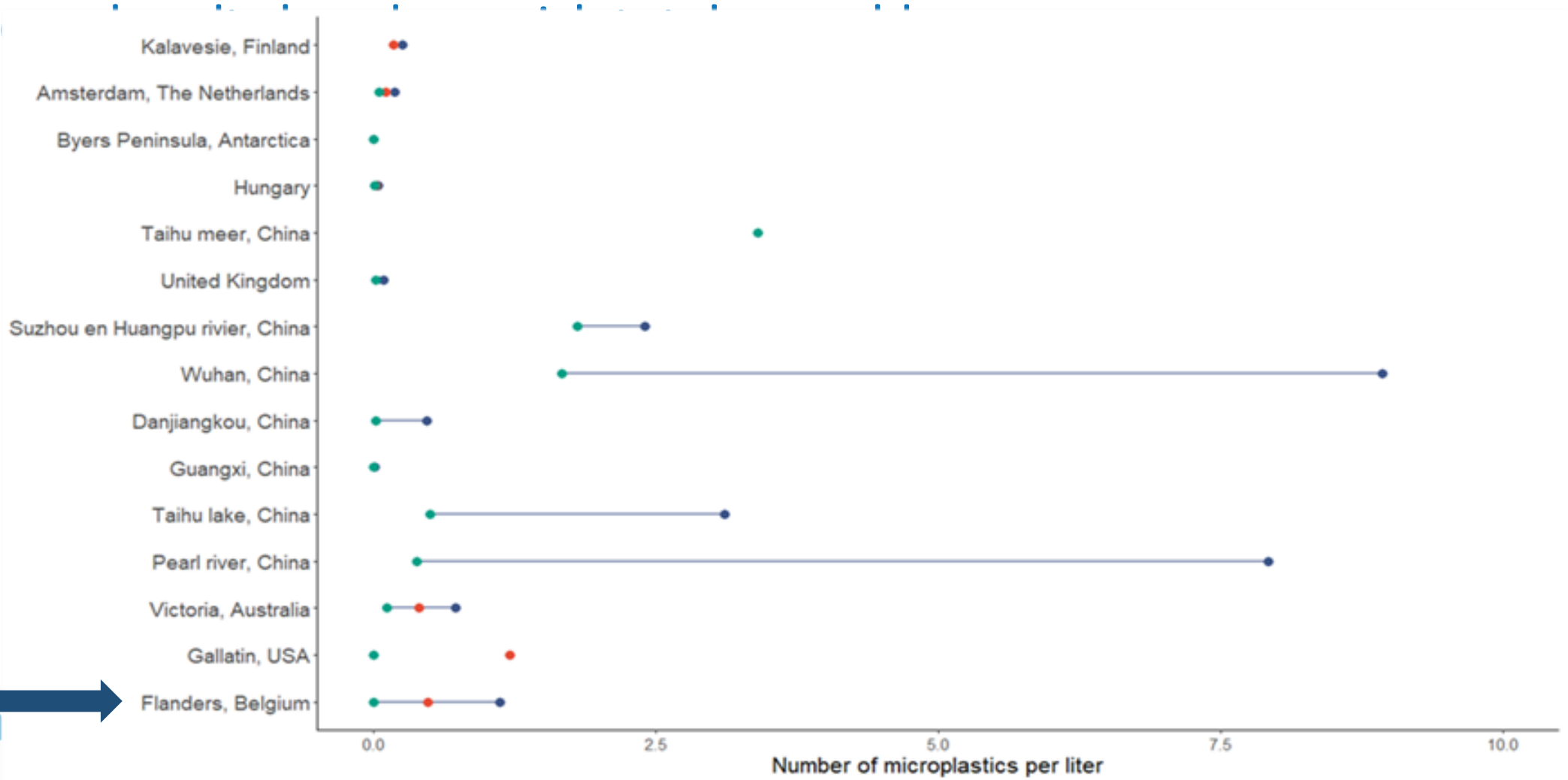


■ Polypropylene ■ Polystyrene ■ Polyvinylchloride

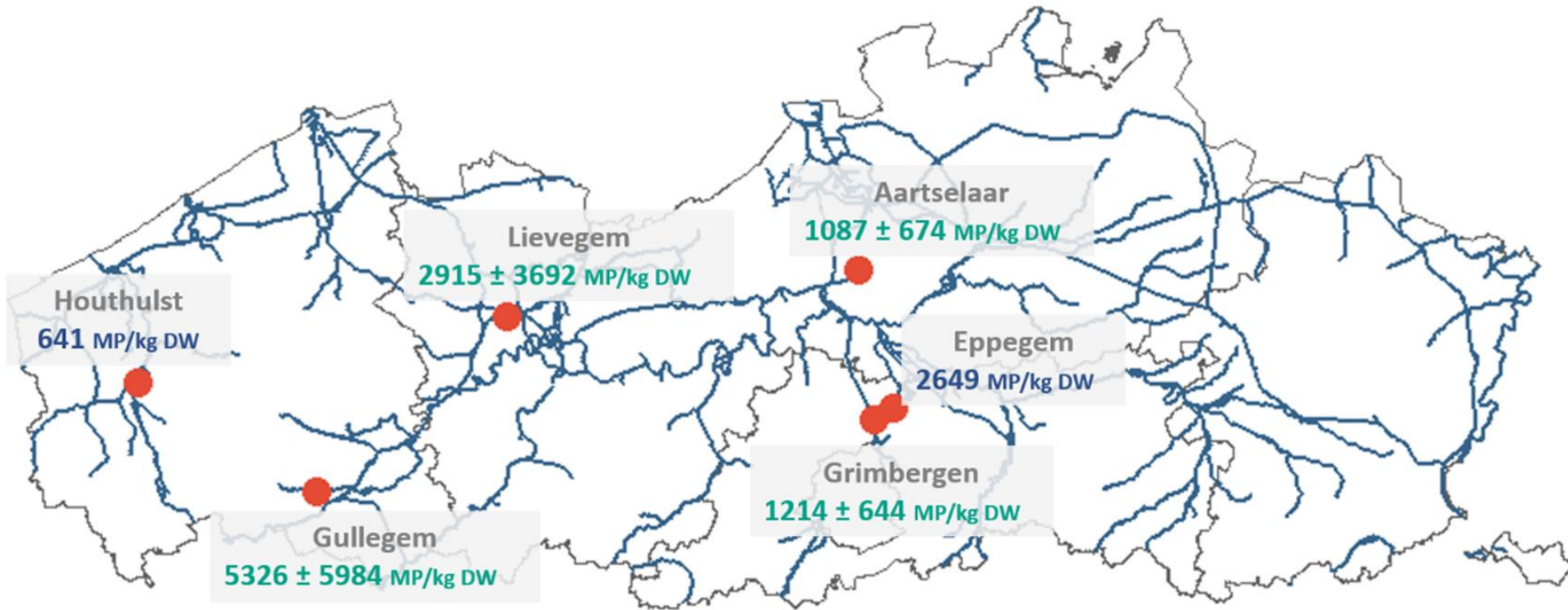
A



Ho  
A



# Microplastics in sediment



MP concentratie droog weer  
MP concentratie nat weer

